

THE PREPARATION OF CONCRETE FOR STRUCTURAL USE

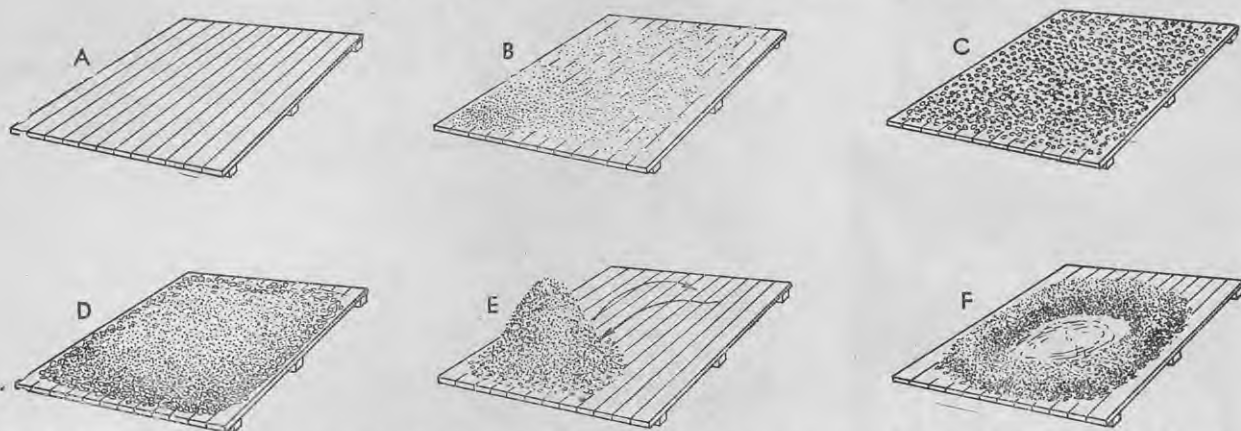


Fig. 2—Stages in mixing concrete by hand. A—Flat surface made of timber. A concrete floor or slab can also be used. B—Sand scraped over the surface. C—Coarse aggregate spread over the surface. D—Sand and then cement spread over the aggregate. E—Ingredients stacked in a heap. The heap is worked to the other end of the board and then back to its original position. F—The mixture is spread out and a hollow made in the centre. The water is then added and the mixture mixed from the outside in to the centre.

The first step in hand mixing is to measure the coarse aggregate. If one small measuring box is being used and the mix is 1:2:4, the box is filled level with the top and emptied four times. If two boxes are used, the larger is filled level with the top only once and emptied. The boxes are placed on the mixing surface, filled more than level with the top, and the surplus brushed off with a straight-edge. The box is emptied by lifting and the coarse aggregate spread out over the mixing surface.

Next, measure the fine aggregate, using the small box in exactly the same way as for the large aggregate and filling and emptying twice only. Spread the fine aggregate over the coarse. Measure the cement, using the small box once only. Spread the cement over the sand.

These operations will result in a bed of gravel, sand, and cement spread over the mixing surface. This bed is then shovelled into a heap to one side of the mixing surface. The heap is moved by shovelling to the other side of the surface and back again to its original position. The knack of shovelling the dry mix to ensure a uniform distribution of all materials is soon acquired, each shovelful being spread over the heap and not dumped.

As the success of the concrete depends on a thoroughly-uniform distribution of the materials, they should be turned over in the manner described until there is no doubt about their being thoroughly mixed.

When the mixture has been turned over at least twice the heap is again spread over the mixing surface and a ridge scraped round the edge, leaving a hollow in the middle. The water is poured into the hollow, and the ridge gradually pushed inward, the mixture being mixed all the time so that none of it remains dry. When the mix is all moistened it is turned over and puddled and sufficient water added to reduce the whole mix to the degree of plasticity required for the

work. Fig. 2 shows the various stages of hand mixing.

A square-nose, long-handled (Cornish) shovel is the most suitable for mixing concrete, and should be used in the direction of the planks when mixing on a board surface.

Machine Mixing

Machine-mixing procedure differs from that of hand mixing because, owing to the bowl of the machine being wet from the previous mix, the ingredients cannot be mixed dry; if the materials were put into the bowl dry, they would cake on the beaters and bowl.

The mixing procedure with a mixer, whether hand or power operated, is begun by placing about two-thirds of the water required for the completed mix in the mixer and then a measured quantity of cement. A power-driven mixer will be revolving all the time these operations are being carried out, but a hand mixer must be given a few turns to mix the cement and water thoroughly. Next, add about two-thirds the measured quantity of mixed aggregate and mix until all is moistened. The remainder of the aggregate can then be added and sufficient water added a little at a time to reduce the mix to the plasticity required. When all ingredients have been put into the mixer mixing should be continued until the consistency of the mix is uniform throughout. The mix can then be deposited in a wheelbarrow for disposal, and the operation repeated.

As a small mixer will be used for most farm concreting operations, measuring boxes are not necessary, the shovel being the most convenient measuring medium. The average 3 cub. ft. mixer will hold comfortably a mix measured by the shovel. A mix of, say, 1:2:4 will be 1 shovelful of cement, 2 of sand, and 4 of gravel, a total of 7 shovelfuls. Table 3 sets out units of weights and measures that are helpful in calculating quantities of material to be mixed.

TABLE 3—WEIGHTS AND MEASURES

1 cub. yd.	= 27 cub. ft.
1 ton of cement	= 24 cub. ft.
	= 18 hessian or 24 paper bags
94lb. of cement	= 1 cub. ft.
1 hessian bag of cement	contains 1½ cub. ft.
1 paper bag of cement	contains 1 cub. ft.
1 hessian bag of cement	contains 1½ bushels
1 hessian bag of cement	weighs 125lb.
1 paper bag of cement	weighs 94lb.
4 hessian bags of cement	will mix about 1 cub. yd. of concrete of 1:2:4 mix.

Care should be taken to see that all shovelfuls are equally piled. Cement will pile higher than gravel or sand, and if it is not measured exactly, it may cause the mix to be richer than intended.

Handling Concrete

Because concrete is plastic, the ingredients of the mix can become badly disposed by vibration. If wet concrete is conveyed in a wheelbarrow, the vibration consolidates the mix, driving off the water, and if the carrying is continued for any length of time, the larger stones and gravel will tend to sink to the bottom. If concrete must be transported in a wheelbarrow, it should be remixed in the barrow before placing.

This effect of vibration on concrete is used to consolidate a mix after placing it in moulds, as in the manufacture of concrete posts. For this application, however, the vibration is controlled and is not carried to the point where redistribution of the particles begins to take place, but is used solely for consolidation and to release trapped air.

The process of tamping or spading concrete placed in forms produces the same effect as vibrating and for this reason concrete can be overtamped. Tamping is necessary with the use of forms to ensure that no gravel pockets are left and to remove all coarse material from the outside surface to produce a clean finish.

When concrete is run down a chute into forms the heavy aggregate tends